Chapter 14: Vermicomposting, Worm Composting

Earthworms are naturally present in soils and their presence contributes greatly to soil health. Earthworms till the soil by digging tunnels or channels. Through the process of burrowing, worms mix leaves and sift materials through the earth. Worm composting, or *vermicomposting*, is a method that uses particular types of worms to turn food wastes into a rich soil amendment. Worms are capable of producing more high-grade compost in a shorter time than any other method. If done correctly, vermicomposting creates no odor!

Worms spend their entire lives eating food and reproducing. The reproduction rate of worms is quite high. The digestion of organic matter by worms produces a very fertile soil amendment called worm castings. For these reasons, earthworms are considered invaluable to healthy soils. The application of herbicides and pesticides reduces the earthworm population in the soil and can leave soils nutrient deficient and sterile.

Usually redworms, *Eisenia foetida* or *Lumbricus rubellus*, are used due to their ability to eat half their body weight in food every day! Redworms, also called Red Wigglers are also ideal for vermicomposting because they can dwell and feed on the surface. On the other hand, since they are surface dwellers, red worms will not survive in the soil unless they are under something that generates warmth, such as a compost pile or manure pile (which is why some are called manure worms). Regular earthworms will not work well in a worm bin because they do not eat food much, preferring leaves and other forest debris. The ingredients of a vermicomposting system consist of kitchen scraps, but they can also digest yard trimmings. Different types of worms have different food preferences. There are other less commonly available types that eat food.

One important consideration that is arising across the northern part of the United States is the issue of non-native worm species threatening ecosystems. Many of the worms found in the U.S. are exotic species that have been imported by settlers. Recent research indicates that these non-native species are decomposing forest debris at a rapid pace and are affecting the plant diversity in certain parts of the country. The extent to which the damage is done is still not known. Try to choose native worm species when starting your vermicomposting system.

In deciding whether to have a worm bin, it is also important to consider whether anyone in the household is overly sensitive to mold spores or fungi. If so, the worm bin could aggravate the situation. If someone in the household does have the sensitivity but there is a suitable warm location for the bin outside the home environment, such as in a shed, it would be possible to have a worm bin, and use the castings outside.

Building a Worm Mansion

In order to start a worm composting system you will need: a container of some sort, moisture, air, food, darkness, and of course, worms! These conditions can be created in a

number of ways. The first thing you want to do is build a container that suits the quantity of food wastes produced in your household. For example, a worm box that is approximately 2' X 2' wide and 8" to 18" high, containing one pound of worms (approximately 1,000 worms) would be suitable for two people in a home. (Each pound of scraps collected requires about 1 ft² surface area, OR a bin should have about 2 ft² of surface area per person contributing food scraps.) For instruction on how to build a wooden two person worm bin see Appendix C.

Be sure to provide plenty of aeration by drilling holes no larger than ¼" in the sides or bottoms of the container. If larger holes are desired, cover them with screening. If a plastic container is used, more holes may be needed for two reasons. Plastic doesn't breathe so more airflow is needed. Also this tends to make plastic bins much more wet than wooden ones. The worm bin must be covered in order to keep unwanted pests out of you pile. For a plastic bin, an old heavy rug can be used instead of the plastic cover, which will help keep bugs out but allow greater air movement.

The next step after building the bin is to put some sort of bedding in the bottom. Moistened newspaper usually works well, however, you could use aged peat moss, aged manure, sawdust, shredded cardboard or soil. If using newspaper, shred into ½"-1" strips. Fluff the strips as you fill the worm bin. Then, sprinkle water on the newspaper to moisten it. Next, add a handful of garden soil for the worm to digest and toss the bedding with you hands just as you would a salad! To minimize invasion by unwanted bugs, such as fruit flies, you always need to keep all food scraps well covered. Using newspaper requires a deeper layer of covering. If fruit flies become a problem, try switching to soil.

Locate your worm bin where the conditions are convenient for people and optimal for earthworms. Red worms thrive at about 55°-75° temperatures. A warm basement, patio, garage, or even the kitchen is great places for a worm bin.

You are now ready to add the main ingredient—worms! Redworms can be found in bait shops (make sure they are identified as *Eisenia foetida* or *Lumbricus rubellus*: some worms identified as red worms in bait shops are not the right variety), in a friend's compost pile or worm bin, in the yellow pages under "worm farms," or through mail order companies found on the Internet. Approximately one pound of worms should be buried gently near the bottom of the bedding. Then, a handful or two of food should be buried near the worms. Gently cover with the bedding. It is a good idea to leave the worm bin alone for two weeks in order to allow the worms to become accustomed to their new environment. Once adjusted, they will eat more and more quickly.

After the first two weeks, you can add food scraps every day. Conversely, worms can be fed once a week, once every two weeks, or whatever works for you. As long as the worms have bedding and food, they will be content. Worms can eat most things we eat and even a few things we cannot, such as vegetable trimmings, coffee grounds and filters, tea bags, fruit peels, and leftovers.

(Beware that fruit in the bin may attract fruit flies!) Worms should not be fed meat, fish,

or large amounts of dairy. Odors may occur when these materials are decomposing. As with all other backyard composting methods, cat and dog feces should not be fed to your worms. There are harmful organisms present in this material. Worms eat ½ to 1 times their body weight in a day, so the amount of food you can add depends on the size of your bin and the number of worms you have.

Maintaining your Red Wigglers

Be sure to continue feeding your worms regularly. It is fine to adjust feeding schedules, but be sure not to overstuff your worm bin. Too much food added all at once can make it hard for the worms to eat before decomposition creates odors. A convenient way to feed the worms weekly is to divide the bin into 4-8 sections, depending on the size of the bin. Keep a record of where food is buried and alternate the sections. Most of the food will be eaten when you return to the section you started with. If you are using newspaper or other organic bedding you may need to add bedding about every 1-3 months. Keep the bedding as moist as a wrung out sponge, adding water when needed.

If you are using newspaper, after six months, you will find an inch to several inches of nutrient rich compost in the bottom of your bin. If you are using soil as the bedding, it is still a good time to harvest the worm castings from the bin. Worms move away from light and temperature and moisture extremes. With these factors in mind, you can select your own harvesting method. (Mary Applehof's **Worms Eat My Garbage** is a wonderful book about vermicomposting and contains several methods for harvesting.)

Harvesting Worm Castings

The simplest way to harvest worm castings is move the finished compost to one side of the bin and put fresh bedding on the other side. For one month, only apply food scraps to the side with the fresh bedding. This supply of fresh food will move the earthworms from the decomposed pile to the fresh one. When the old bedding and food scraps are completely composted you can remove it from the bin and replace with fresh bedding. If you have two worm bins, you can simply stop feeding one and let the worms finish composting the ingredients. If you would like, you can add the compost to the garden, worms and all!

Another fun, yet time consuming, method of harvesting castings is to remove the worms, compost, and food scraps from the bin and spread on a tarp in the light. Make many small, conical piles on the tarp. The light will cause the worms to move down into the center of the piles. Be careful about leaving worms in a hot sun. Worms get sunburn and could die from too much heat or the pile drying out too much. Gently scrape the top layer of castings off the small piles, until you reach the worms. Force the worms to burrow into the piles even deeper so that you can remove even more of the fresh castings. Repeat this over and over until the worms are piled in the middle of a ring of castings. You can immediately use the castings in your garden and begin another worm bin with the worms. You can also use a similar method by keeping the top off the worm bin and slowly scraping off a top layer as it dries and the worms burrow deeper.

A quicker method, especially for larger amounts of vermicompost is to buy or make a screen, ¼ inch hardware cloth will do. The vermicompost must be fairly dry and crumbly for this method to work. The screen can be put on a slant in a tarp, leaning against the bin or it can be placed on a collection container. Scoopfuls (a dust bin does nicely) are brushed around - placed on the upper part if slanted and brushed down to the bottom (gloves are recommended). The worms left are dumped off the screen into a pile (slapping the screen will get them off quicker). If desired, worms that made it through can be collected by hand and added to the reject/worm pile. This method will not remove all the worms, and if the worms are in a juvenile stage, many will fall through. Enough worms will be removed to restart the worm bin.

Using Worm Castings

Worm castings are a very stable form of humus and will not burn plants like other fresh manures. Castings are very high in nutrient content and contain high populations of beneficial microorganisms. Each time worm castings are incorporated into the soil, a diversity of microbes is inoculating the soil.

Use worm castings in potting mixes, on transplants, on houseplants, and to amend soils. They can be sprinkled on a lawn. Castings should not be used directly as potting soil. They do not have sufficient 'structure' to support plant roots.

Castings should not be used as mulch outside unless there is no other purpose for them. They are too high in nutrients. They tend to dry out and the nutrients are wasted.

Worm Bin Troubleshooting

Problems	Causes	Solutions
Worms are dying	Food & bedding are all eaten	Harvest compost. Add fresh bedding & food.
	Too dry	Add water until damp. Because worm eggs are viable for relatively long periods, the worms will repopulate themselves even if most worms are dead.
	Extreme temperatures	Move bin so temperature is between 40-80° F.
	Something toxic has gotten into the bin.	Harvest worms, separate and quickly rinse them with water. Clean bin, restart with fresh bedding.
	Casting have not been harvested for a long time.	Worms cannot live long in 100% castings. Harvest castings and add fresh bedding.
Bin attracts flies and/or bad smells	Food exposed or overfeeding Non-compostables present	Add 4-6" layer of bedding and stop feeding for 2-3 weeks. Remove meat, dairy, fats, etc.
Bin full of fruit	Food not sufficiently	If the infestation is minor, try making a fruit
flies or other	covered.	fly trap to put under the cover. Traps can be
obnoxious insects. Bin is full of ants.	Ants found bin to be a	made with baby food or other small jars. Make a funnel with a small opening for the top, either with a piece of paper or the corner of a plastic bag with a small hole in it. Place something attractive to the insect in the jar. Fruit flies like yeast, so beer or wine vinegar works well. Place the funnel on top and seal it with a rubber band or tape. If the insects don't die on their own, drown them, or release them outside. If bin has become very infested it may be time to remove worms, rinse them quickly with water, empty and clean bin and restart. First try applying petroleum jelly or a similar
222 22 232 32	good home.	substance to all legs or base of bin. Stir up bin and see if the ants disappear. If this doesn't work, restart the bin.
Worms escaping bin	Bedding too dry or too acidic.	Add water. Add small amounts of baking soda or garden lime, particularly with large amounts of citrus peels.
Sow bugs, beetles	These are good for your	If bothersome, stop feeding for one or two
in bin	worm bin.	weeks. If bugs remain, harvest and start over.